



Challenges and Solutions to Implementing PHIN Compliant HL7 v3 RIM Derived Public Health Case Messages

Irene Culver

David Dassey, M.D., MPH

Jason Siegel, M.D.

Ray Aller, M.D.

Los Angeles County Department of Health Services
and
Atlas Development Corporation Division of Public Health



- Background & History
- Enterprise Architecture
- Practical Message Building Steps
- Sample RIM Mapping & Message
- Future Activities & Suggestions



Irene Culver

Project Manager

Electronic Disease Surveillance Systems (EDSS)
Bioterrorism Preparedness and Response
Acute Communicable Disease Control Program
Los Angeles County Public Health



- Initial Disease Surveillance System
 - Visual Confidential Morbidity Report (VCMR)
 - Added functionality over time
 - Is part of the next generation system
- Evolving to Enterprise Architecture Framework
 - Public Health Incident Management System (PHIMS)
 - System of heterogeneous systems
 - Multiple vendors developing the systems
- Strategic Planning Group
 - Vendor Integration Meeting to solve integration issues
 - HL7 RIM Committee focusing on messages



- Software concept and planning 1996
- Development and testing 1999
 - Object oriented client on relational server
 - Disease surveillance & outbreak detection
- Live operation 2000
 - Incorporated 10 years of historical data
- Software evolution 2001-
 - Alerting module
 - Real-time laboratory interfaces
 - Browser-based case submissions
 - Incorporation of LOINC & SNOMED coding



Jason A. Siegel, MD

Chief Medical Informaticist

Atlas Public Health
Atlas Development Corporation

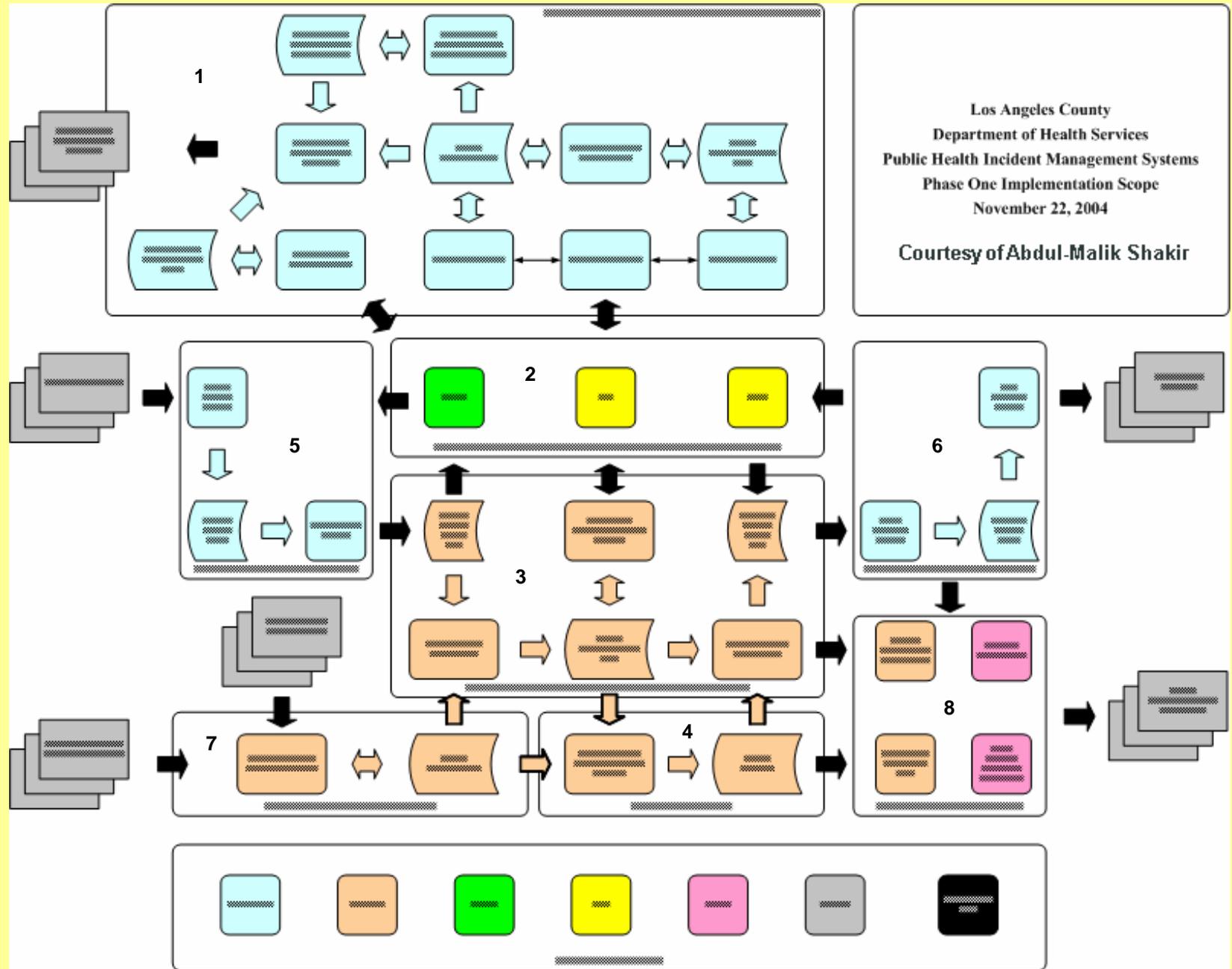


- Goal is tell a story about message design
- Will highlight logic behind building RIM message
- Will trace history of researching RIM concepts
- No discussion of model tools or message tools
- Audience needs some knowledge of HL7 RIM
- Data source not necessarily RIM derived
- This is a work in progress, still developing



Why LACO Needs Messages

Los Angeles County
 Department of Health Services
 Public Health Incident Management Systems
 Phase One Implementation Scope
 November 22, 2004
 Courtesy of Abdul-Malik Shakir





1. Authentication, Authorization, Alerting
2. Incident Management, Common Area Modules
3. Operational Data Store
4. Data Mart
5. Inbound Message Processing
6. Outbound Message Processing
7. Knowledge Management
8. Business Intelligence



- PHIMS Components & Connections
 - 8 Functional modules
 - 34 Separate system components
 - 21 Distinct intra-module message types
 - 16 Internal inter-module messaging pathways
 - 6 External message types
- Vendor Integration Meeting Questions
 - Should internal interaction be by API or message?
 - Internal interactions should be with messages
 - Should internal & external messages be different?
 - Internal and external messages should be the same
 - What should the message format be
 - XML if possible to/from external source



1. Identify the Message Consumers
2. Document the Message Requirements
3. Define the Message Content
4. Specify the Message Structure
5. Build Your Own OID Tree
6. Apply Your OIDs to Record Instances
7. Select Standard Vocabularies
8. Create Custom Vocabularies and OIDs
9. Map the Data Content to the Structure
10. Generate the Message



1. Identify the Message Consumers

- LACO PHIMS Enterprise Components
 - Need to transfer data between components
- Other Counties or Jurisdictions
 - No Immediate Need
- California State Public Health
 - Need for Case Data from Counties
- The CDC and other National Agencies,
 - No Direct data interchange with LACO



2. Document the Message Requirements

- LACO Enterprise Immediate Needs
 - Identified and prioritized by Integration Group
 - Need to load Data Store with VCMR Cases
 - Need to send VCMR case reports to the State
- California State Public Health Needs
 - Having conversations with CA DHS personnel
 - Neither content nor structure has been finalized
 - Concerns about message content needs
 - Simple Case data for internal use and sending to CDC
 - Complex investigation data for jurisdictional transfer
 - Concerns about message structure needs
 - Have considered using HL7 2.5 Reference Message
 - Currently Leaning towards Clinical Document Architecture



3. Define the Message Content

- LACO Decision to Start with Visual CMR Data
 - Same data currently sent as flat file to State
 - Will model the message using HL7 tools
- Three Message Types of Varying Complexity
 - Minimum CMR Data as input by providers
 - Extended CMR Data adds labs and risk factors
 - Case Report adds investigation data and contacts
- Minimum CMR Data Set Fields

Disease Name	Ethnicity	Address
Disease Short Name	Occupation	Home City
Disease ICD9	DOB	Home State
Last Name	Age	Home Zip Code
First Name	SSN	Home Phone
Middle Name	Is Patient Pregnant	Work Phone
Gender	Expected Delivery Date	Reporting Source
Race	Home Street	Reporting Source Phone



4. Specify the Message Structure

- HL7 version 2.5 Referral Message
 - Pros: Well defined, In wide use for patient care
 - Cons: No PH focus, not PHIN compliant
- HL7 version 3.0 Case Report Message
 - Pros: Well Defined, PHIN Compliant
 - Cons: Not well suited for free-form notes
- HL7 Clinical Document Architecture
 - Pros: Contains RIM elements, well suited for notes
 - Cons: Need template to confine structure
- Build Your Own RIM Derived Message
 - Pros: Reduces coding work, PHIN compliant (?)
 - Cons: Need to write the implementation guide



Study the RIM to Build Messages



HL7 Version 3 - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <C:\Educate\Medical\HL7\AdcMemb\Ballots\HL7v3b7CL\html\foundationdocuments\welcome\index.htm> Go

HL7 Introduction/Backbone march 2004 **v3**

HL7 Version 3 Standard

- Introduction/Backbone
- Version 3 Guide
- Refinement and Localization
- Glossary
- Reference Information Model
- Vocabulary
- Data Types: Abstract
- XML Implementation Technology Specification
- UML Implementation Technology Specification
- Transport Specifications
- Common Domains
- Infrastructure Management Domains
- Administrative Management Domains
- Health and Clinical Management Domains
- Schemas and Examples
- Downloads
- Known Issues

Legend

Informative	DSTU
Reference	Draft
Normative	Document Group

Introduction/Backbone

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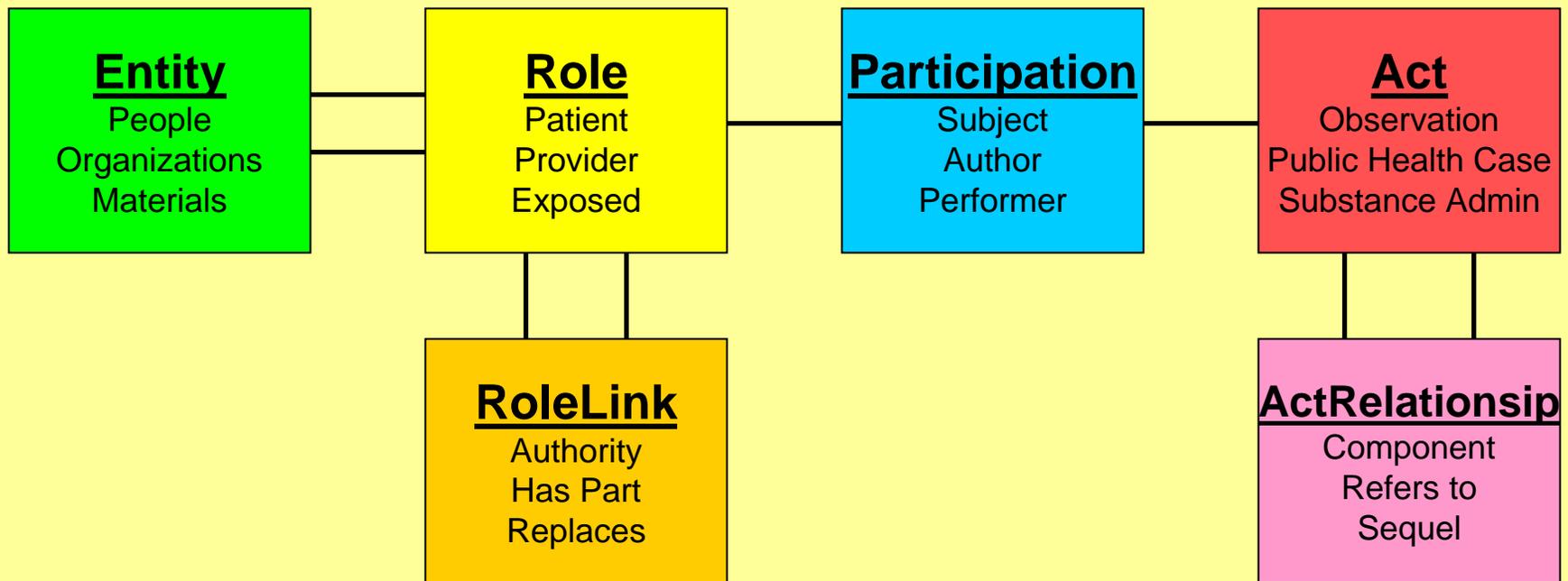
- 1 [Foreword](#)
 - 1.1 [Copyright Notice](#)
 - 1.2 [HL7 Special Acknowledgments](#)
 - 1.3 [Ballot Questions](#)
 - 1.4 [Contact Us](#)
- 2 [V3 Packages](#)
 - 2.1 [Ballotable Documents in the V3 Package](#)
 - 2.1.1 [Foundation Documents](#)
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 - 2.2 [Other Foundation Documents in the V3 Package](#)
 - 2.3 [Special Documents for Comment Only](#)
- 3 [Backbone Welcome](#)
- 4 [HL7 Organizational Overview](#)

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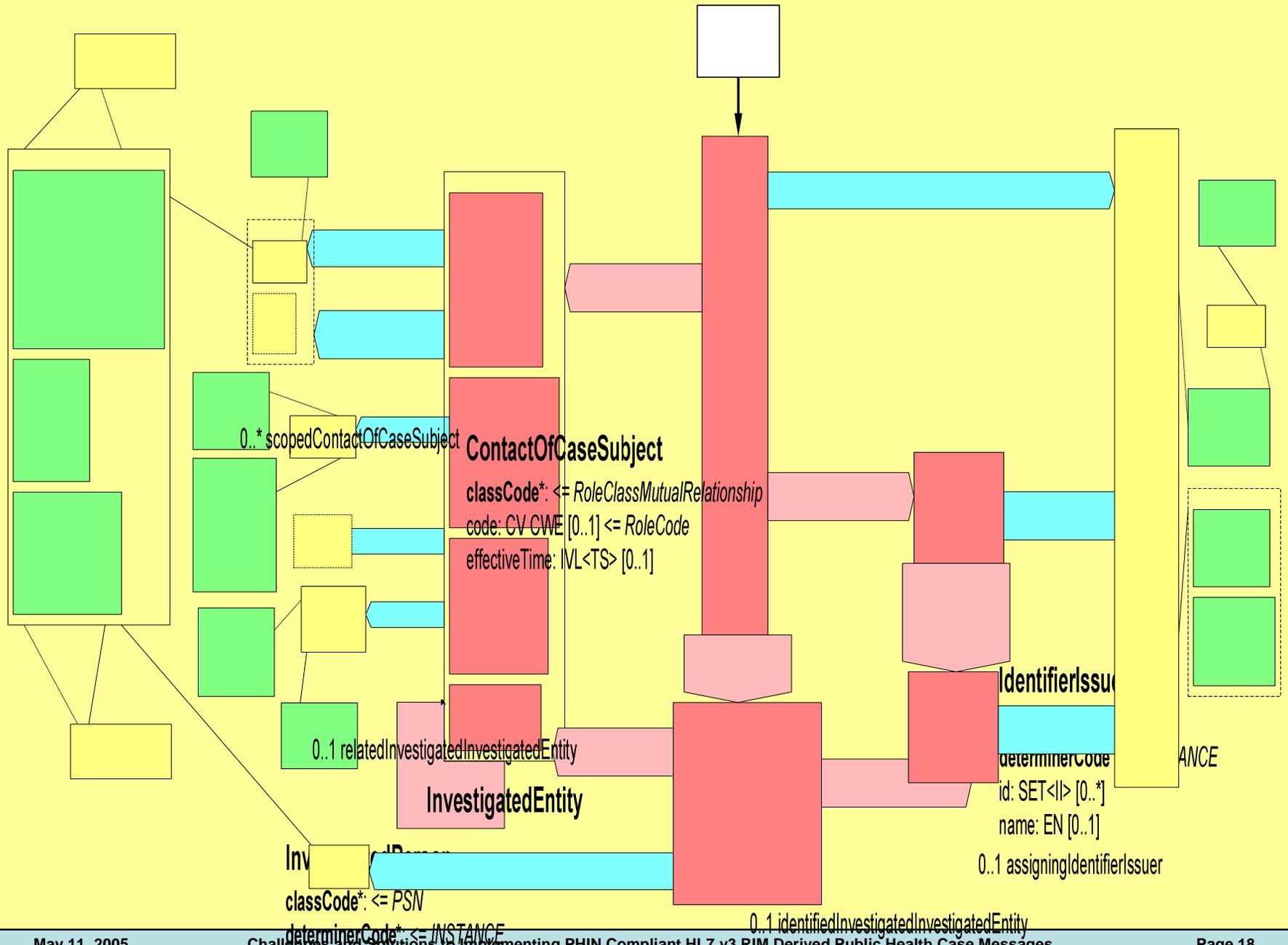


- HL7 version 3 Reference Information Model
 - Structure: Small number of general classes
 - Data Types: Simple and complex
 - Vocabulary: Controls possible values





Case Report Refined Message Information Model





- PH Case is an Observation is an Act
- Sample (not all) PH Case Attributes
 - Act.classCode :: CS
 - Coded Simple requires HL7 vocabulary
 - Act.id :: SET<II>
 - Unordered List of Instance Identifiers, needs OID
 - Act.code :: CD
 - Concept Descriptor requires a vocabulary
 - Observation.value :: ANY
 - Any data type, including collections of data types
 - PublicHealthCase.detectionMethodCode :: CE
 - Coded with Equivalents requires a vocabulary



5. Build Your Own OID Tree

- An Object Identifier is an Ordered List of Integers
 - Used to unambiguously identify information instances
 - Includes vocabularies, record identifiers
- Atlas OID Tree Example
 - ADC: 2.16.840.1.113883.3.33
 - iso/itu.country.usa.company.hl7.member.adc
 - VCMR: 2.16.840.1.113883.3.33.4.2.2
 - <adc root>.phdiv.products.vcmr
 - LACO: 2.16.840.1.113883.3.33.4.10.101
 - <adc root>.phdiv.clients.laco
 - LACO VCMR
 - Main Server: 2.16.840.1.113883.3.33.4.2.2.10.101.1
 - DB Tables: 2.16.840.1.113883.3.33.4.2.2.10.101.1.1
 - Case Table: 2.16.840.1.113883.3.33.4.2.2.10.101.1.1.25
 - Case Recs: 2.16.840.1.113883.3.33.4.2.2.10.101.1.1.25.9



6. Apply Your OIDs to Record Instances

- Case Investigation Instance Identifier as XML

```
<id root="2.16.840.1.113883.3.33.4.2.2.10.101.1.1.25.9"
extension="1477" assigningAuthorityName="Los
Angeles County Department of Health Services"
displayable="true"></id>
```

Table 17: Property Summary of Instance Identifier

Name	Type	Description
root	UID	A unique identifier that guarantees the global uniqueness of the instance identifier. The root alone may be the entire instance identifier.
extension	ST	A character string as a unique identifier within the scope of the identifier root.
assigningAuthorityName	ST	A human readable name or mnemonic for the assigning authority. The Assigning Authority Name has no computational value. The purpose of a Assigning Authority Name is to assist an unaided human interpreter of an II value to interpret the authority. Note: no automated processing must depend on the assigning authority name to be present in any form.
displayable	BL	Specifies if the identifier is intended for human display and data entry (displayable = true) as opposed to pure machine interoperation (displayable = false).



7. Select Standard Vocabularies

- HL7 Supplies All Required Vocabularies (CS)
 - ActClass: 2.16.840.1.113883.5.6
 - ActMood: 2.16.840.1.113883.5.1001
- HL7 Supplies Most Other Vocabularies (CE, CD)
 - ActCode: 2.16.840.1.113883.5.4
- HL7 Supplies OIDs for External Vocabularies
 - LOINC: 2.16.840.1.113883.6.1
 - SNOMED-CT: 2.16.840.1.113883.6.96
- Can Download All Registered OIDs from HL7
 - Country Codes: 2.16.1
 - CDC PHIN: 2.16.840.1.114222.4



- CaseDetectionMethod Vocabulary Does Not Exist
 - Listed in HL7 Ballot 7 Foundation Vocabulary web page
 - Hyperlink goes to empty table
 - Vocabulary OID does not exist in HL7 ballot 8 database
- Entity Id Type Codes HL7 Vocabulary Does Not Exist
 - Referred to in the PHIN Implementation Guide (2003)
 - Refers to HL7 Vocabulary OID 2.16.840.1.113883.5.148
 - This OID does not exist in HL7 ballot 8 database
- Nationally Notifiable Disease List (NND)
 - List exists, is updated by the CDC, and downloadable
 - This list serves as the basis for reporting cases
 - Yet the we cannot find an OID assigned to it
- Implications
 - Wasted time looking for Vocabularies and OIDs
 - Forced to create local Vocabulary and/or OID



- We Want to Send the Disease as an NND Code
 - We could use the Observation value to hold it
 - But the NND List has no OID, so we assign one
 - Atlas PH External Vocab: 2.16.840.1.113883.3.33.4.6
 - Atlas External NND OID: 2.16.840.1.113883.3.33.4.6.22
 - `<value code="10180" codeSystem="2.16.840.1.113883.3.33.4.6.22" codeSystemName="NND List" displayName="Mumps">`
- We Need to Send the Detection Method
 - HL7 suggests values but offers no vocabulary
 - We want our own anyway, for special terms
 - Atlas VCMR Vocab: 2.16.840.1.113883.3.33.4.2.2.5
 - Atlas Detect Vocab: 2.16.840.1.113883.3.33.4.2.2.5.11
 - `<detectionMethodCode code="RN-SCH" codeSystem="2.16.840.1.113883.3.33.4.2.2.5.11" codeSystemName="DetMeth" displayName="School Nurse">`



9. Map the Data Content to the Structure



• Older VCMR Mapping to Case Report Message

Sample VCMR HL7 RIM PH XML Message	Data Source Metadata Path
<?xml version="1.0" encoding="UTF-8" ?>	
- <PublicHealthCase xmlns="urn:hl7-org:v3" xmlns:xsi="http://www.w3.org/2002/XMLSchema-instance" xsi:schemaLocation="urn:hl7-org:v3 PORR_HD100001.xsd">	
<id root="2.16.840.1.113883.19.6.000000" extension="DI-1477" displayable="true" />	IN_DiseaseIncident.DI_CMRecord
<code code="{PhAct}" codeSystem="2.16.840.1.113883.5.4" codeSystemName="ActCode" displayName="{Ph-DiseaseNotification}" />	{TBD HL7 – PH Notify ActCode}
<text>Web CMR Disease Incident Record DI-1477 Case Report</text>	IN_DiseaseIncident.DI_CMRecord
<statusCode code="New" />	IN_DiseaseIncident.DI_ProcessStatusDR → DI_IncidentProcessStatus.IPS_Status
- <effectiveTime>	
<low value="20031215" inclusive="true" />	IN_DiseaseIncident.DI_DateSubmitted
<high value="" inclusive="true" />	IN_DiseaseIncident.DI_DateClosed
</effectiveTime>	
- <activityTime>	
<low value="20031215" inclusive="true" />	IN_DiseaseIncident.DI_DateSubmitted
<high value="" inclusive="true" />	IN_DiseaseIncident.DI_DateClosed
</activityTime>	
- <detectionMethodCode code="{PhCode}" codeSystem="2.16.840.1.113883.5" codeSystemName="codeSysName" displayName="{Ph-DetectionMethod}">	{TBD HL7 – PH Detect MethodCode}
<originalText>Other</originalText>	IN_DiseaseIncident.DI_ReportSourceDR → E_ReportSource.RS_Type
</detectionMethodCode>	
- <author>	

Sample VCMR HL7 RIM PH XML Message	Data Source Metadata Path
<component1>	
- <component3>	
- <observationProcess>	
<id root="2.16.840.1.113883.19.6.000000" extension="DI-1477" displayable="true" />	IN_DiseaseIncident.DI_CMRecord
<code code="{PhAct}" codeSystem="2.16.840.1.113883.5.4" codeSystemName="ActCode" displayName="{PhAct-Observation}" />	{TBD HL7 – PH Observe ActCode}
<text>Patient positive for disease: AHF = AFRICAN HEMORRHAGIC FEVER</text>	IN_DiseaseIncident.DI_DiseaseDR → DIC_Disease.DIS_ShortName
- <effectiveTime>	IN_DiseaseIncident.DI_DateSubmitted
<low value="20031215" inclusive="true" />	IN_DiseaseIncident.DI_DateClosed
<high value="" inclusive="true" />	
</effectiveTime>	
- <activityTime>	
<low value="20031215" inclusive="true" />	IN_DiseaseIncident.DI_DateSubmitted
<high value="" inclusive="true" />	IN_DiseaseIncident.DI_DateClosed
</activityTime>	
<value code="x8070" codeSystem="2.16.840.1.113883.6.5" codeSystemName="Systemized Nomenclature in Medicine Reference Terminology" displayName="Ebola virus infection" originalText="AFRICAN HEMORRHAGIC FEVER" />	IN_DiseaseIncident.DI_DiseaseDR → DIC_Disease.DIS_SNOMEDDR → DIC_SNOMED.SNMD_ConditionID & DIC_SNOMED.SNMD_ConditionName
<interpretationCode code="A" codeSystem="2.16.840.1.113883.5.83" codeSystemName="ObservationInterpretation" displayName="Abnormal" />	IN_DiseaseIncident.DI_DiseaseDR
<methodCode />	
<location><!-- CMET 'COCT_MT0900000' reference suppressed (participant) --></location>	
<participant><!-- CMET 'COCT_MT0900000' reference suppressed (assignedEntity) --></participant>	



10. Generate The Message



• Older VCMR Case Report Message

```

<?xml version='1.0' encoding='UTF-8'?><PublicHealthCase xmlns="urn:hl7-org:v3" xmlns:xsi="http://www.w3.org/2002/XMLSchema-instance"
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displayable="true"></id><code code="{PhAct}" codeSystem="2.16.840.1.113883.5.4" codeSystemName="ActCode" displayName="{Ph-
DiseaseNotification}"></code><text>Web CMR Disease Incident Record DI-1457 Case Report</text><statusCode
code="active"></statusCode><effectiveTime><low value="20031126" inclusive="true"></low><high value=""
inclusive="true"></high></effectiveTime><activityTime><low value="20031126" inclusive="true"></low><high value=""
inclusive="true"></high></activityTime><detectionMethodCode code="{PhCode}" codeSystem="2.16.840.1.113883.5"
codeSystemName="codeSysName" displayName="{Ph-
DetectionMethod}"></detectionMethodCode><author><assignedEntity>&lt;!-- CMET &#39;COCT_MT0900000&#39;
reference suppressed (assignedEntity) --&gt;</assignedEntity></author><patient><patient><id root="2.16.840.1.113883.19.6.000000" extension="PER-
183762" displayable="true"></id><patientPerson><id root="2.16.840.1.113883.19.6.000000" extension="PER-183762" displayable="true"></id><name
use="L"><given></given></name><telecom value="" use="H"></telecom><administrativeGenderName code="F" codeSystem="2.16.840.1.113883.5.1"
codeSystemName="AdministrativeGender" displayName="Female"></administrativeGenderName><birthTime value=""></birthTime><deceasedInd
value="false"></deceasedInd><deceasedTime value=""></deceasedTime><addr use="HP"><streetAddressLine>
</streetAddressLine><city></city><state></state><postalCode></postalCode><country></country></addr><maritalStatusCode code=""
codeSystem="2.16.840.1.113883.5.2" codeSystemName="MaritalStatus" displayName=""></maritalStatusCode><educationLevelCode code=""
codeSystem="2.16.840.1.113883.5.1077" codeSystemName="EducationalLevel" displayName=""></educationLevelCode><raceCode code=""
codeSystem="2.16.840.1.113883.5.104" codeSystemName="Race" displayName="" originalText="AFGHAN"></raceCode><ethnicGroupCode code=""
codeSystem="2.16.840.1.113883.5.50" codeSystemName="Ethnicity" displayName=""
originalText="AfricanAmerican"></ethnicGroupCode><patientPerson><patient><responsibleParty><territorialAuthority><territory><code
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HC"></code></territory></territorialAuthority></responsibleParty><subject1><functionCode><code code="" codeSystem="2.16.840.1.113883.5.88"
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displayName="Patient"></code></exposedEntity><id root="2.16.840.1.113883.19.6.000000" extension="PER-183762" displayable="true"></id><name
use="L"><given></given></name><telecom value="" use="H"></telecom><administrativeGenderName code="F" codeSystem="2.16.840.1.113883.5.1"
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codeSystem="2.16.840.1.113883.5.1077" codeSystemName="EducationalLevel" displayName=""></educationLevelCode><raceCode code=""
codeSystem="2.16.840.1.113883.5.104" codeSystemName="Race" displayName="" originalText="AFGHAN"></raceCode><ethnicGroupCode code=""
codeSystem="2.16.840.1.113883.5.50" codeSystemName="Ethnicity" displayName=""
originalText="AfricanAmerican"></ethnicGroupCode><scopedRole><code code="{PhRole}" codeSystem="2.16.840.1.113883.5.11"
codeSystemName="RoleCode" displayName="{PhRole-Scope}"></code></scopedRole><effectiveTime><low value="20031126" inclusive="true"></low><high value=""
inclusive="true"></high></effectiveTime></scopedRole></exposedPerson><effectiveTime><low value="20031126" inclusive="true"></low><high
value=""
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nent2><substanceAdministrationProcess></substanceAdministrationProcess></component2><component1><procedureProcess></procedureProcess>
</component1><component3><observationProcess><id root="2.16.840.1.113883.19.6.000000" extension="DI-1457" displayable="true"></id><code
code="{PhAct}" codeSystem="2.16.840.1.113883.5.4" codeSystemName="ActCode" displayName="{PhAct-Observation}"></code><text>Patient
positive for disease: = </text><effectiveTime><low value="20031126" inclusive="true"></low><high value=""
inclusive="true"></high></effectiveTime><activityTime><low value="20031126" inclusive="true"></low><high value=""
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Medicine Reference Terminology" displayName="" originalText=""></value><interpretationCode code="A" codeSystem="2.16.840.1.113883.5.83"
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entInformation1><pertinentActEvent></pertinentActEvent></pertinentInformation1><pertinentInformation2><pertinentEncounterEvent></pertinentEnco
unterEvent></pertinentInformation2></PublicHealthCase>

```



- We are in the process of fully modeling the CMR message using formal HL7 tools
- We need to regularly engage the message stakeholders, especially California DHS, to ensure the message meets all needs
- We need to bring vocabulary and OID issues to the appropriate agencies for resolution
- We need to encourage a government agency (maybe NLM) to take responsibility for making standard vocabularies and OIDs centrally available
- We need to encourage the CDC and HL7 to make their draft documents available on-line earlier so we can better anticipate requirements

